

CLAIMS

1. A method comprising:

providing a standard multimedia data stream, the stream containing encoded multimedia data and standard uniform error correction data for error correcting the encoded multimedia data, the uniform error correction data providing substantially the same uniform error correction for each portion of the encoded multimedia data;

selecting some stream portions of the standard multimedia data stream but not other stream portions of the multimedia data stream for additional unequal error correction, the selection depending on the importance of the type of data contained in the stream portions to the quality of the presentation of the multimedia data;

generating selection map data indicating which stream portions were selected for the additional unequal error correction;

generating additional unequal error correction data for corresponding selected stream portions and not for the other stream portions that were not selected;

first transmitting the standard multimedia data stream with the uniform error correction data into a first channel;

second transmitting enhancement data including the selection map data and the additional unequal error correction data into a second channel, the second channel being a different channel than the first channel;

whereby for the selected stream portions, both uniform error correction data and additional unequal error correction data are transmitted, and for the other stream portions, only uniform error correction data are transmitted.

2. The method of claim 1 wherein providing a standard stream includes:

providing raw multimedia data;

encoding the raw multimedia data to provide encoded multimedia data;

generating uniform error correction data for the encoded multimedia data, the uniform error correction data providing substantially the same robustness of error correction for all portions of the encoded multimedia data; and

generating the standard multimedia data stream of sequential standard transmission frames, each standard frame containing a fixed-size portion of the encoded multimedia data followed by a fixed-size portion of the uniform error correction data.

3. The method of claim 2 wherein:

the encoded multimedia data includes elementary stream packets;

the packets each contain a packet header and a packet data portion;

the packets include video packets and audio packets, the packet data portions of the video packets containing video data and the packet data portions of audio packets containing audio data;

each standard transmission frame contains the uniform error correction data generated for error correcting the encoded multimedia data contained in the same standard frame;

the uniform error correction data includes forward error correction data; and

the standard multimedia data stream conforms with a ATSC DTV standard or a DVB standard.

4. The method of claim 1 wherein:

the method further comprises generating third error correction data for error correcting the enhancement data, the third error correction data providing substantially the same uniform error correction for all of the enhancement data; and

the second transmitting includes transmitting the third error correction data with the enhancement data through the second channel.

5. The method of claim 4 wherein:

the method further comprises generating an enhancement data stream of fixed-size enhancement transmission frames, each enhancement transmission frame containing a fixed-size portion of enhancement data and a fixed-size portion of the uniform error correction data, the enhancement data including the selection map data and the additional unequal error correction data; and

the second transmitting includes transmitting the enhancement data stream through the second channel.

6. The method of claim 5 wherein:

the multimedia stream includes audio portions containing audio data and the more important stream portions that are selected include substantially all the audio portions;

the third error correction data contained in each of multiple enhancement transmission frames is for error correcting the enhancement transmission data of the same enhancement transmission frame;

the additional unequal error correction data is transmitted in the same order as the portions of the standard data stream for which it was generated; and

the uniform error correction data and the additional unequal error correction data and the third error correction data each include forward error correction data.

7. The method of claim 1 wherein:

the first transmitting includes using the standard multimedia data stream to modulate a first analog carrier wave at a first frequency and transmitting the modulated carrier wave through a medium; and

the second transmitting includes:

generating an enhancement data stream containing the selection map data and the unequal error correction data; and

using the enhancement data stream to modulate a second analog carrier wave at a second frequency that is different than the first frequency and transmitting the second modulated carrier wave through the medium.

8. The method of claim 1 wherein:

the standard multimedia data stream is organized into fixed-size standard transmission frames;

the method further comprising:

logically organizing the standard transmission frames into groups of multiple sequential standard transmission frames;

logically organizing the selection map data and the additional unequal error correction data for the group of sequential standard transmission frames into corresponding groups of multiple fixed-size sequential enhancement data transmission portions;

the second transmitting includes transmitting the enhancement transmission frames.

9. The method of claim 8 wherein:

for a group of enhancement data transmission portions, each enhancement data transmission portion includes a fixed-size portion of the selection map data and a fixed-size portion of the additional unequal error correction data for the corresponding group of sequential enhancement transmission frames.

10. The method of claim 8 wherein for a group of standard transmission frames, all the selection map data is packed into sequential sections of the enhancement data transmission portions, and then the unequal error correction data is packed into subsequent sequential sections of the enhancement data transmission portions.

11. The method of claim 8 wherein:

sequential sections of the additional unequal error correction data are interleaved with respect to the order of the corresponding selected portions in the group of standard transmission frames.

12. The method of claim 1 wherein:

the selected stream portions include video portions containing video data and audio portions containing audio data; and

selecting the stream portions includes:

selecting substantially all of the audio portions;

selecting substantially all of the video portions that contain video header information; and

selecting sequences of video portions immediately following the video portions containing header information, the number of video portions in the sequences of video portions depending on a predetermined criteria related to a predefined bit rate for the second transmitting.

13. The method of claim 12 wherein:

the stream portions being fixed-size packets, each packet containing a packet header and a packet data portion, the audio data being packed into the packet data portions of audio packets and the video data being packed into the packet data portions of video packets;

the video header information including: frame headers, slice headers, macroblock headers, and block headers;

the predetermined criteria includes a proportion of the packets that are to receive enhanced protection, the proportion of packets being dynamically adjusted to at least approximately provide a predetermined bit rate for the second transmitting.

14. The method of claim 12 wherein:

the standard multimedia data stream is organized into fixed-size packets, each packet containing a packet header and a packet data portion, the audio data being packed into the packet data portions of audio packets and the video data being packed into the packet data portions of video packets, the packets each being logically divided multiple packet segments;

the selecting of multimedia data portions includes:

selecting substantially all the packet segments of the audio packets;

selecting substantially all the packet segments that contain video header information;

selecting sequences of packet segments containing video data that immediately following the packet segments containing video header information; and

selecting the packet segments containing the packet headers of any packets in which any packet segments are selected.

15. The method of claim 1, further comprising:

receiving the standard multimedia data stream from the first channel;

receiving the selection map data and the unequal error correction data from the second channel;

first error correcting the selected stream portions according to the selection map data using the additional unequal error correcting data;

second error correcting the encoded multimedia data portions using the uniform error correction data.

16. A multimedia stream transmitter, comprising:

signal processing means (112) : for providing a standard multimedia data stream, the stream containing encoded multimedia data and uniform error correction data useful for error correcting the encoded multimedia data, the uniform error correction data providing substantially the same robustness of error correction for each portion of the encoded multimedia data of the standard multimedia data stream; for selecting some stream portions of the standard multimedia data stream but not other stream portions of the standard multimedia data stream, the selection depending on the importance of the type of data contained in the stream portions to the quality of the presentation of the multimedia data; for generating selection map data indicating which of the stream portions were selected; and for generating additional unequal error correction data for the selected stream portions and not for other stream portions that were not selected;

transmitting means (114) for transmitting the standard multimedia data stream into a first channel, and for transmitting enhancement data including the selection map data and the additional unequal error correction data into a second channel, the second channel being different than the first channel.

17. The transmitter of claim 16, wherein the signal processing means includes an input terminal (110) for providing the standard multimedia data stream.

18. The transmitter of claim 16, wherein:
providing a standard multimedia data stream includes: providing encoded multimedia data; generating the uniform error correction data for the encoded multimedia data; and generating the standard multimedia data stream containing the encoded multimedia data and uniform error correction data.
19. The transmitter of claim 18, wherein the signal processing means includes an encoded input terminal (110) for providing the encoded multimedia data.
20. The transmitter of claim 18, wherein:
providing encoded multimedia data includes: providing raw multimedia data and compressing the raw multimedia data to provide the encoded multimedia data.
21. The transmitter of claim 20, wherein the signal processing means includes an input terminal (110) for providing the raw multimedia data.
22. A multimedia stream transmitter, comprising:
a receiver (202) for receiving raw multimedia data;
an encoder (204) that compresses the raw multimedia data for providing encoded multimedia data;
a first error correction generator (206) that generates uniform error correction data for the encoded multimedia data, the uniform error correction data providing substantially the same robustness of error correction for each portion of the encoded multimedia data;
a multiplexer (208) that formats the encoded multimedia data and the uniform error correction data to provide a standard multimedia data stream;
a selector (210) that selects some stream portions of the standard multimedia data stream but not other stream portions of the standard multimedia data stream for additional unequal error correction, and that generates selection map data indicating which of the stream portions were selected for additional unequal error correction, the selection

depending on the importance of the type of data contained in the stream portions to the quality of the presentation of the multimedia data;

a second error correction generator (212) that generates additional unequal error correction data for the selected stream portions indicated by the selection map data and not for other stream portions that were not selected;

a first transmitter (220) for transmitting the standard multimedia data stream into a first channel; and

a second transmitter (222) for transmitting enhancement data including the selection map data and the additional unequal error correction data into a second channel, the second channel being different than the first channel.

23. A multimedia data stream receiver, comprising:

receiving means (232) for receiving a standard multimedia data stream from a first channel, the standard stream containing encoded multimedia data and uniform error correction data; and for receiving enhancement data including selection map data and unequal error correction data from a second channel, the second channel being different than the first channel;

processing means (234) for first error correcting portions of the standard stream according to the selection map data using the additional unequal error correction data, the selection map data indicating that some portions of the standard stream are to be corrected in the first correcting and other portions of the standard stream are not be corrected in the first correcting; and for second error correcting all the encoded multimedia data using the uniform error correction data, the uniform error correcting providing substantially the same robustness of error correction for each portion of the multimedia data of the standard stream; and

transmission means (236) for transmitting the error corrected encoded multimedia data after the first and second error correcting of the data.

24. A multimedia data stream receiver, comprising:

a first receiver (254) that receives a standard multimedia data stream from a first channel, the standard stream containing encoded multimedia data and uniform error

correction data for error correction of the encoded multimedia data, the uniform error correction data providing substantially the same robustness of error correction for each portion of the encoded multimedia data;

a second receiver (252) that receives enhancement data including selection map data and additional unequal error correction data from a second channel; the second receiver also receiving third error correction data from the second channel; the second channel being a different channel than the first channel;

a first error correction unit (256) that error corrects the enhancement data using the third error correction data;

a second error correction unit (258) that provides a first error correcting of portions of the standard data stream according to the selection map data using the additional unequal error correction data;

a third error correction unit that provides a second error correcting of the encoded multimedia data using the uniform error correction data;

an output (262) for transmitting the error corrected encoded multimedia data after the first and second error correcting of the data.

25. Related signals comprising:

a standard multimedia data stream (120) in a first channel, the standard stream containing encoded multimedia data and uniform error correction data useful for error correcting the encoded multimedia data, the uniform error correction data providing substantially the same robustness of error correction for each portion of the encoded multimedia data of the standard stream; and

enhancement data (130) in a second channel, the enhancement data including selection map data (136,142) and additional unequal error correction data (137,144), the selection map data being an indication of which portions of the standard stream are to be corrected using the additional unequal error correction data and which other portions of the standard stream are not to be corrected using the additional unequal error correction data, the second channel being a different channel than the first channel.

26. A medium (140,141) containing the related signals of claim 25 in different respective channels of the medium.